WATER MONITORING NETWORK IN THE CHICKASAWHATCHEE SWAMP, SOUTHWEST GEORGIA

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Abstract. The Chickasawhatchee Swamp, located in southwest Georgia, is a large wetland complex encompassing more than 30,000 acres. The Upper Floridan aquifer underlies this region and is a major source of water for Spring Creek; one of four inflow streams. Interaction between the creek and aquifer is complex and being studied. Wells have been installed at thirteen sites in the western part of the swamp. Groundwater levels are taken hourly and water quality samples are taken monthly. Two surface-water sites on Spring Creek and two depressional wetlands are also sampled for water quality. Groundwater levels varied between sites suggesting recharge and discharge zones. Surface-water samples taken from Spring Creek had concentrations of calcium, 50 to 60 mg/L, specific conductance, 0.270 to 0.320 mS/cm, and magnesium, 1.1 to 1.4 mg/L. These concentration ranges were the same as water samples taken from groundwater wells located along Spring Creek. As more data are collected, the swamp's hydroperiod and surface water/groundwater interactions will be further understood.

INTRODUCTION

The Chickasawhatchee Swamp is the second largest wetland complex in the state of Georgia and is located in the corner of Baker, Calhoun, and Dougherty Counties (Golladay and Battle, 2001) (Figure 1). The uplands are mainly slash pine plantations with even age stands ranging from 10 to 60 years old with scattered depressional wetlands. Four creeks dissect the Swamp which typically flood during normal years to inundate large acres of bottomland hardwood forest. These wetlands hold water and release it slowly to maintain creek water levels and aquifer water levels in times of below normal precipitation. Little is known about the hydrology of this swamp. With the purchase of more than 21,000 acres of this land by the State of Georgia, it has opened up the area for much needed research. Our goal is to gather the basic data needed to gain a better understanding of the surface water/groundwater interactions in the swamp.

METHODS

Thirteen wells were installed in the western portion of the swamp to measure aquifer water levels and take groundwater, stream, and wetland samples for water chemistry analysis. Nine of these wells are 4-inch diameter open hole wells that tap the upper Floridan aquifer. The remaining four wells are 2-inch diameter and screened in the water-table aquifer. Surface-water sites were also established, two along Spring Creek and two in wetlands.

Continuous water-level fluctuations are monitored in the wells and the two surface water sites in the wetlands. The well sites are equipped with Ott Orphimedes data loggers. These monitors use the bubble principle to measure fluctuations in water levels.

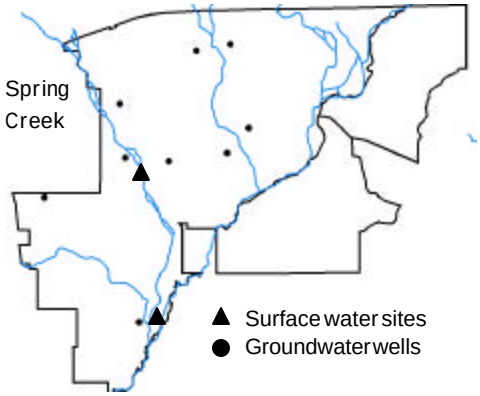
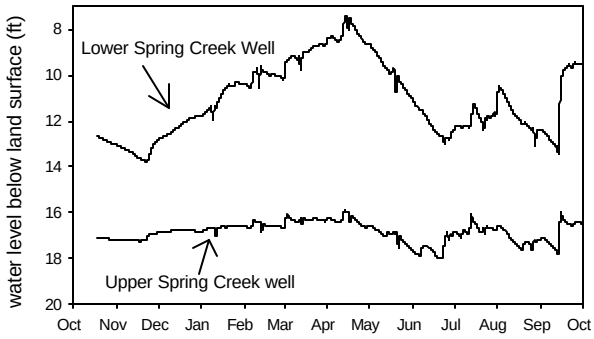


Figure 1. The study site, the Chickasawhatchee Swamp with well and surface water sampling locations.



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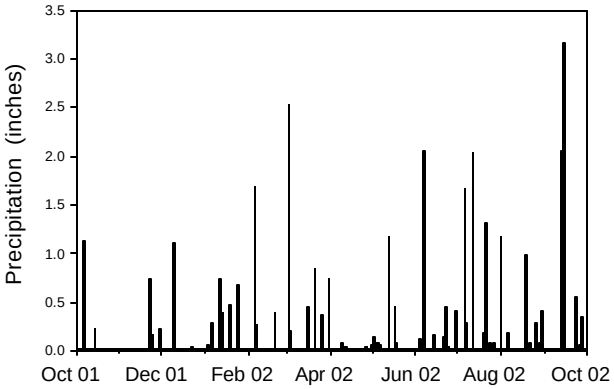

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Figure 2. A) Annual groundwater fluctuations in two wells located along Spring Creek. B) Daily precipitation in inches at USGS gauging station number 02354410 located on Chickasawhatchee Creek.

The wetland sites are outfitted with Ott Thalimedes data loggers. These recorders use a float operated shaft encoder with integral data logger for water-level measurements. Data were downloaded monthly to a personal computer from the data loggers. Data loggers were installed in the wells in October 2001 and collect one water-level reading per hour. Data loggers were installed at the wetland sites in January 2002.

Monthly water-quality samples were taken from January 2002 to October 20002. Grab samples were taken at the surface water sites, two along Spring Creek and two in the wetlands. A Grundfos Redi-flow 2 pumping unit was used for the collection of groundwater samples. Three well volumes of water were purged before samples were taken. A Hydrolab Quanta, with flow-through chamber, was attached to measure temperature, specific conductivity, pH, salinity, dissolved oxygen, and percent dissolved oxygen. Samples were gathered in triplicate in 1L, acid-washed polypropylene bottles, stored on ice, and returned to the lab. Triplicate 60-ml glass BOD bottles were also collected for use in methane measurements. The water from the 1L bottles was filtered using ashed Whatman 4.25 cm GF/F, and subsamples were collected for various chemical analysis. Dissolved organic carbon (DOC) and dissolved inorganic carbon (DIC) were measured using a Shimaduzu TOC-5050 analyzer. NH_4, NO_3, PO_4, SO_4, and Cl were measured on a Lachat Quickchem 8000. Ca, K, Na, and Mg were measured on a Perkin Elmer 5100 PC atomic absorption spectrophotometer.

RESULTS

Areas of the swamp react to changes in water abundance in different ways. Some areas seem to serve as recharge zones, as other areas seem to serve as discharge zones. Annual groundwater fluctuations vary from site to site with changes of 8 ft. in some, to less than 2 ft. in others (Figure 2). Wells located along Chickasawhatchee Creek and lower Spring Creek have large water-level fluctuations. Wells located in the upper Spring Creek area have groundwater levels with little change.

Spring Creek has large inputs from the Upper Floridan aquifer that provides base flow in times of drought. Groundwater contains higher concentrations of Ca, Mg and alkalinity, and lower concentrations of TOC and sulfate, which is indicative of carbonate

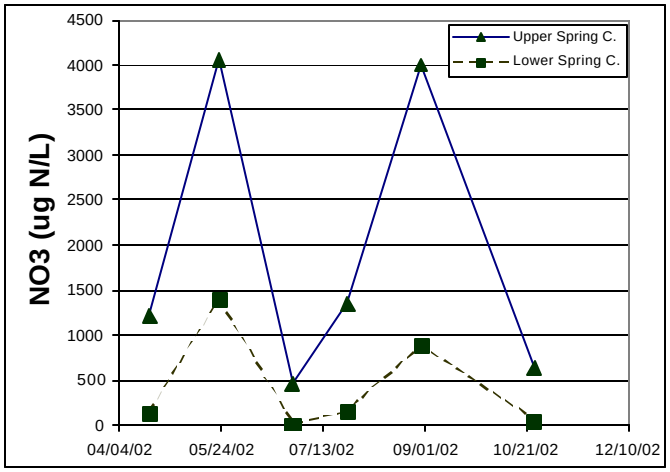

Figure 3. Nitrate concentrations in surface water samples taken from two sites along Spring Creek.

dissolution in the Upper Floridan aquifer. (Torak 2001) These concentrations are seen in surface-water samples taken from Spring Creek. The surface-water samples have concentrations of 50 to 60 mg/L for calcium, 1.1 to 1.4 mg/L for magnesium, and the specific conductance ranges from 0.270 to 0.320 mS/cm. The groundwater samples taken from wells in the Upper Floridan aquifer, along Spring Creek, showed concentrations in the same ranges as the surface water.

Nitrate concentrations in surface-water samples revealed higher concentrations in the upstream site compared to the downstream site (Figure 3). During periods high flow times, nitrate concentrations decreased. As stream flow rates decreased, nitrate concentrations increased.

CONCLUSIONS

Data collected from our monitoring network has allowed a preliminary hydrologic assessment of the swamp and aquifer system. Recharge and discharge zones are being delineated. Water from Spring Creek was determined to have large inputs from the Upper Floridan aquifer. And Spring Creek nitrate levels were consistently lower in the downstream site compared to the upstream site. As more data are collected and analyzed, the monitoring network will provide a database for better understanding of the swamp and its function.

ACKNOWLEDGEMENTS

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